Table of Contents

1.0 Introduction

Efforts to cleanup past contamination at Department of Energy (DOE) sites have resulted in increasing volumes of contaminated media for treatment and proper disposal. This "non-routine" waste volume, as shown in Figure 1.1, is expected to increase in future years. Contaminated media volume projections, as stated in the sites' accelerated cleanup plans and low-level waste disposal capacity report, indicate that low-level wastes (LLW) from cleanup and stabilization activities (non-routine) will dwarf LLW volumes from current DOE operational activities if generated at the projected rate (Figure 1.2). The 6.9 million m^3 of projected non-routine LLW is waste which will be managed ex situ. An additional 25 million m^3 of LLW will be managed in situ.

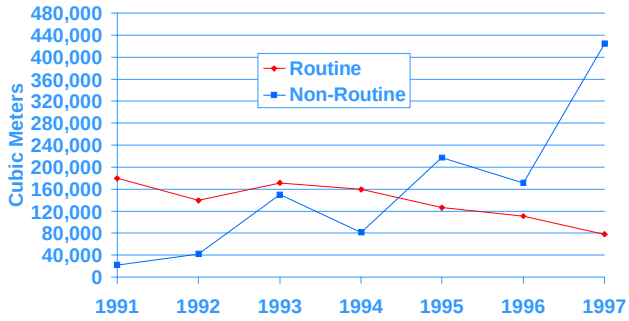
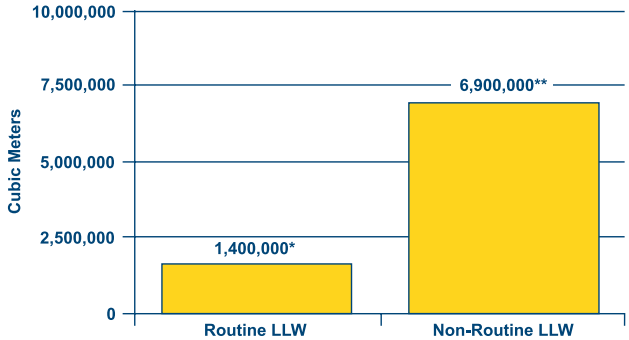


Figure 1.1 DOE Complex-Wide Waste Generation (Routine vs. Non-Routine)

In keeping with the DOE's mission to protect the environment, EM-40 has recognized the need to integrate pollution prevention/waste minimization (P2/WMin) into the remediation and decommissioning process to reduce the risks associated with waste management and to reduce waste volumes and waste management costs. It is a significant challenge to minimize wastes during environmental restoration (ER) activities, but by understanding that primary wastes can be efficiently recycled/reused or minimized and secondary wastes can be reduced or eliminated, the challenge can be met.



* Data compiled from the WM PEIS
** Data compiled from the EM-40 Core Database

Figure 1.2 Anticipated LLW Generation from Routine & Non-Routine Activities (20 Year Projection)

It is important to note that the word "generates" is used throughout this document when referring to cleanup activities. "Generates" usually applies to newly created waste, or secondary waste, such as waste created as a result of doing work. Primary wastes, such as landfill debris or contaminated soil and groundwater, are not "generated" during cleanup activities. They were "generated" in prior years during production activities and are merely accounted for during cleanup. The Office of Environmental Restoration does not *generate* primary waste, only secondary waste, but for ease of discussion, it will be applied to both forms of waste.

Two of the organizations charged with managing DOE's cleanup program are shown in Figure 1.3.

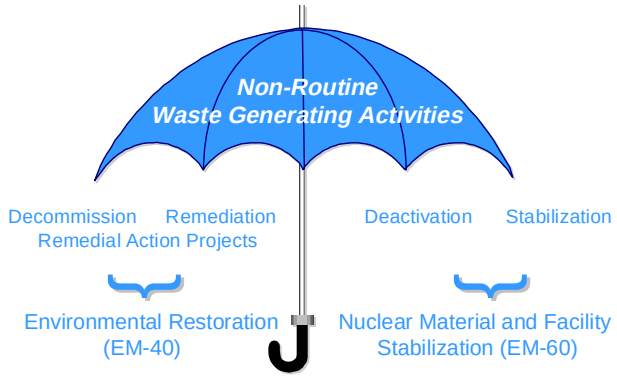


Figure 1.3 DOE's Cleanup Program

The Office of Environmental Restoration (EM-40) manages the decommissioning of facilities and remediation of contaminated media. The Office of Nuclear Material and Facility Stabilization (EM-60) is responsible for the deactivation of facilities and the stabilization of nuclear and non-nuclear chemical materials prior to remediation or decommissioning. This guidance document specifically

focuses on EM-40 activities, and how P2/WMin can be successfully deployed during each ER project—resulting in maximum environmental and financial benefits. This guidance document was prepared for ER project managers, project teams, and decision-making personnel to provide them with the information, resources, and tools needed to successfully evaluate and implement P2/WMin during ER activities.

There are four sections to this document. Section 1.0 provides a brief introduction and overview of the topic and the purpose of the document. Section 2.0 describes the regulatory requirements and policy drivers for applying P2/WMin to ER activities. Section 3.0 discusses the application of P2/WMin to cleanup activities, and Section 4.0 describes the tools and resources available to assist managers and teams with the process of integrating P2/WMin.

2.0 Regulatory Requirements and Drivers for P2/WMin in ER

Figure 2.1 graphically depicts various drivers for practicing pollution prevention and waste minimization in routine, recurring operations. These regulatory drivers, to a large degree, can also be applicable to cleanup activities. Although there are no specific regulations that drive the inclusion of P2/WMin principles in cleanup activities, DOE has chosen to create internal drivers for encouraging and rewarding the evaluation and implementation of waste reduction practices.

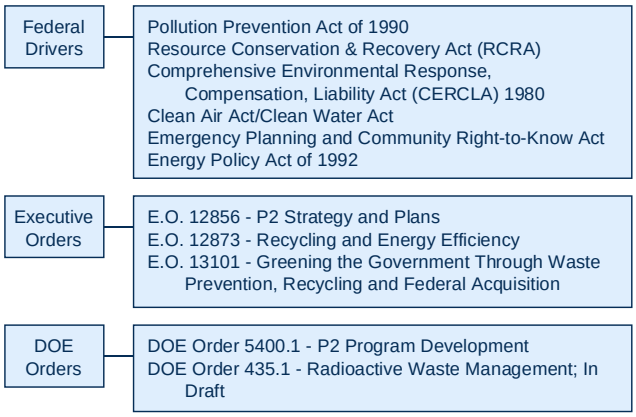


Figure 2.1 P2/WMin Regulatory Matrix

2.1 DOE's Strategic Plan

The highest level DOE document that discusses incorporating P2/WMin in cleanup activities is *DOE's Strategic Plan*. This Plan sets the goals, objectives, and strategies that will be implemented within DOE through the Annual Performance Plan, the budget, and the Performance Agreement with the President. Two objectives in the Strategic Plan deal with the application of P2/WMin to meet DOE goals. Figure 2.2 highlights these two objectives.

The first P2 objective in the Plan states that DOE must "prevent future pollution." To accomplish this objective, the illustrative measure to "reduce waste generation from cleanup and stabilization activities by ten percent annually, beginning in Fiscal Year 1999" was established.

The second P2 objective in the Plan states that the DOE must "reduce life-cycle costs of cleanup."

- **DOE Strategic Plan Objective – Prevent future pollution: reduce waste generation from cleanup and stabilization activities by 10% annually, beginning in FY 99**
- **DOE Strategic Plan Objective – Reduce life-cycle costs of cleanup: enhance performance, increase efficiency, and reduce costs by recycling and other waste minimization techniques**

Figure 2.2 P2/WMin

To accomplish this objective, the illustrative measure to "enhance performance, increase efficiency, and reduce costs by recycling and other waste minimization techniques" was established.

These measures provide the incentive for ER project managers to begin to evaluate and deploy technologies and techniques that will improve productivity and reduce the life-cycle costs of cleanup projects. Progress toward meeting these objectives is to be reported in the Pollution Prevention Quarterly Progress Reports required by the Office of Pollution Prevention (EM-77).

2.2 Accelerating Cleanup: Paths to Closure Document

DOE's *Accelerating Cleanup: Paths to Closure* is a management tool that forecasts, on a project-by-project level, the technical scope, cost, and schedule required to complete 353 ER projects at 53 remaining cleanup sites across the complex. The life-cycle cost estimates provided in the document, for cleanup at these 53 sites, total $147 billion (1997 through 2070). By 2006, DOE intends to complete more than 90 percent of the cleanup activities. *Paths to Closure* provides critical information on technical activities, budgets, risks, and worker safety and health in order to inform the public about these issues and to provide them with the depth of understanding required to make cost-effective and sound decisions.

Paths to Closure provides a closure plan for each site that identifies the key technical and programmatic activities that must occur and the decisions that must be made before a site can be closed. Additionally, a Waste and Materials Disposition Map (flow chart) that describes each projected waste stream, the steps for processing and managing that waste, and where the waste is intended to be permanently disposed (if known) has been produced for each site. Although many of these projections will change due to the development of new technologies, more economical cleanup approaches, and changes in the interests of stakeholders and regulators associated with each site, the Waste Material and Disposition Maps can be utilized as pollution prevention tools. ER project managers and project teams can utilize the site specific Waste Material and Disposition Maps in identifying high priority projects that can be expected to generate large quantities of regulated wastes.

Paths to Closure also discusses the use of "Performance Enhancement Mechanisms" that will help DOE meet the programmatic challenges of accelerating cleanup while reducing costs. Pollution prevention has been identified as one of the mechanisms that will improve efficiencies by reducing waste volumes and associated disposal costs. Other mechanisms that improve efficiencies include technology deployment, integration, project sequencing, contract reform, and lessons learned. The aggressive application of pollution prevention techniques for cleanup projects is expected to provide streamlined approaches for managing wastes.

- **Accelerating Cleanup: Paths to Closure – P2 as a Performance Enhancement Mechanism**

2.3 1996 Pollution Prevention Program Plan

One other document which includes pollution prevention requirements for cleanup and stabilization activities is the *1996 Pollution Prevention Program Plan*. This plan includes the DOE Secretarial Goals to be achieved by December 31, 1999. The Secretarial Goal established for cleanup and stabilization activities states that for all operations, including cleanup and stabilization activities, 33 percent of the sanitary waste must be recycled. Progress toward this goal must be reported annually.

- **Secretarial Goal – Recycle 33% of all sanitary waste from cleanup and stabilization**

2.4 CERCLA and RCRA Drivers for P2/WMin in Cleanup Activities

It is important to note that pollution prevention and waste minimization should be a part of cleanup activities regulated under both the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and under the Resource Conservation and Recovery Act (RCRA). CERCLA includes "reduction in the toxicity, mobility, or volume of a waste through treatment" as one of the nine criteria used to evaluate the acceptability of a response action. RCRA requires that hazardous waste generators have a program in place to reduce both the volume and the toxicity of hazardous wastes. These statutes provide drivers for sites regulated under CERCLA or under RCRA to employ P2/WMin during cleanup actions. Figure 2.3 shows the CERCLA and RCRA processes broken down into phases and the associated waste generation that occurs during these activities. Waste generation typically increases as the project progresses.

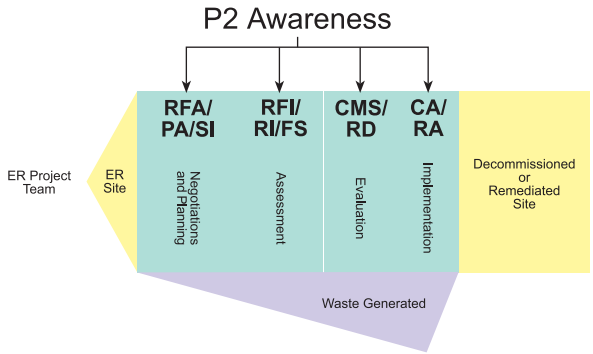


Figure 2.3 P2/WMin integration into the RCRA and CERCLA processes.

3.0 Applying P2/WMin to ER Activities

P2/WMin, as applied to cleanup activities, is directed toward minimizing the projected waste streams that result from a particular cleanup activity, thereby reducing the overall project waste volume, and thus reducing overall project costs. The following sections provide definitions and guidance on P2/WMin principles and techniques and offer methods for incorporating P2/WMin into ER projects.

3.1 P2/WMin Definition for Cleanup Activities

P2/WMin, when utilized during cleanup activities, is focused to be responsive to the projectized nature of the cleanup tasks. This is quite different from historical P2/WMin operations where a steady volume and type of waste is generated on a regular schedule and can be evaluated on an input/output basis. Cleanup operations are dynamic, producing constantly changing baselines as well as varying types of wastes which can often change as the project progresses.

The definition of P2/WMin, as it applies to cleanup, thus becomes "standard or innovative actions, taken during environmental restoration activities, that reduce the quantities of primary and secondary waste streams resulting from those cleanup activities." It also can be defined as "actions that reduce wastes from the most expensive waste type (mixed waste) to a less regulated waste type (low-level or non-hazardous waste)."

> "standard or innovative actions taken during environmental restoration activities that reduce the quantities of primary and secondary waste streams resulting from cleanup activities"

The effective use of P2/WMin principles is accomplished by the evaluation of potential P2/WMin opportunities early in the planning stages of a project, as well as at each progressive stage of a project.

3.2 Definition of Primary and Secondary Wastes

Primary waste is referred to as the "in situ volume of contaminated material to be cleaned or remediated," such as a building or equipment to be decommissioned or the contents of a waste pit to be removed. Primary waste can also be any waste material generated as a result of past activities, sometimes referred to as "legacy waste." Recycle/reuse is the most effective P2/WMin technique for reducing the amount of primary waste destined for treatment and/or disposal. Many primary waste materials have potential value and should be evaluated for possible recycle/reuse. Figure 3.1 depicts a schematic process diagram of how P2/WMin can be applied to a remediation activity.

Secondary waste is added or newly generated waste that is not chemically related to the treatment, remediation, or stabilization process for primary waste. Secondary waste generation adds dramatically to overall waste management costs. Source reduction is the most effective P2/WMin technique for reducing secondary waste generation.

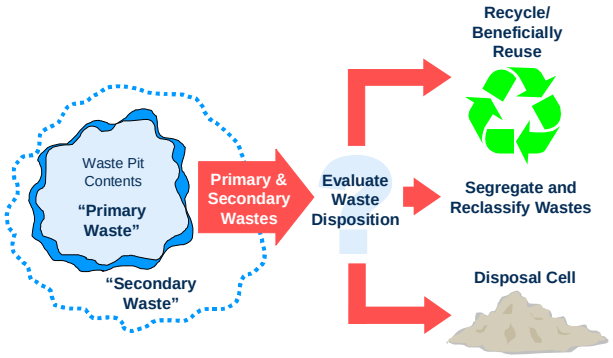


Figure 3.1 - Applying P2/WMin to Remediation Activities

3.3 Benefits of P2/WMin

DOE is committed to P2/WMin because the cost-effective implementation of P2/WMin opportunities during a cleanup project assists DOE in moving beyond Best Management Practices (BMPs) to the aggressive identification of methods to minimize waste volumes, leading to a **reduction in risks and project waste management**

costs. In actively pursuing P2/WMin, DOE also benefits by **reducing long-term liabilities, enhancing stakeholder approval** of DOE activities, and most importantly, **redirecting saved or avoided costs to complete cleanup earlier at other sites**. Each of these benefits supports the overall goal of the DOE's *Accelerating Cleanup: Paths to Closure*; to cleanup more than 90 percent of the DOE sites by 2006, and to do so safely and cost-effectively.

3.4 P2/WMin Techniques

Traditional Environmental Protection Agency (EPA) environmental management hierarchy depicts source reduction as the preferred method or technique of reducing waste generation, followed by recycle/reuse, treatment, and, disposal. These techniques are as applicable to onetime waste generating cleanup activities as to routine operations and should be applied with the same diligence, although at times in different order. The method of applying P2/WMin can vary and will be discussed in Section 3.5.

P2/WMin Techniques

3.4.1 Source Reduction

Source reduction can be applied to both primary and secondary waste streams. The most common technique for achieving source reduction for primary wastes is segregation. The most common technique for secondary wastes is through application of BMPs.

Segregation offers the most cost-effective result in dealing with cleanup wastes. The effect of mixing classifications of waste, such as low-level waste with a mixed waste, results in a larger volume of a more problematic (and more expensive) waste. Commingling of materials not only results in more waste and more costly treatment and/or recycling costs, it also increases disposal costs. In summary, segregation of all wastes during cleanup reduces the volumes of wastes requiring disposal and also increases the potential for and the value of recycling.

Although segregation is an important step in employing source reduction during clean-up; there are other methods which can be used which offer high waste volume reduction in primary wastes.

In situ Treatment is a preferred method of treatment by EPA because it eliminates the need to remove the waste for treatment (ex situ). Therefore, during the decision phase of the project, in situ techniques and treatments should be evaluated. Examples include phytoremediation, in-well air sparging, natural attenuation, and other types of bioremediation.

In-depth Characterization techniques should be utilized to reduce the amount of materials requiring remediation and/or treatment and target only materials above authorized contaminant limits. An example is the real-time gamma ray spectrometer which gives real-time estimates of LLW contaminated soil in order to reduce excavated soil volumes.

Sampling and Analysis waste volume reductions can be achieved by employing P2 techniques during soil and groundwater sampling events such as micro purge, direct push, simulprobe, and statistical sampling methodologies. Analytical laboratory micro-chemistry procedures can be employed during sample analysis to reduce sample sizes and wastes.

Controlled Area Reductions are another source reduction method to reduce wastes. Detailed surveys and administrative controls reduce the spread of contamination by reducing cross-contamination

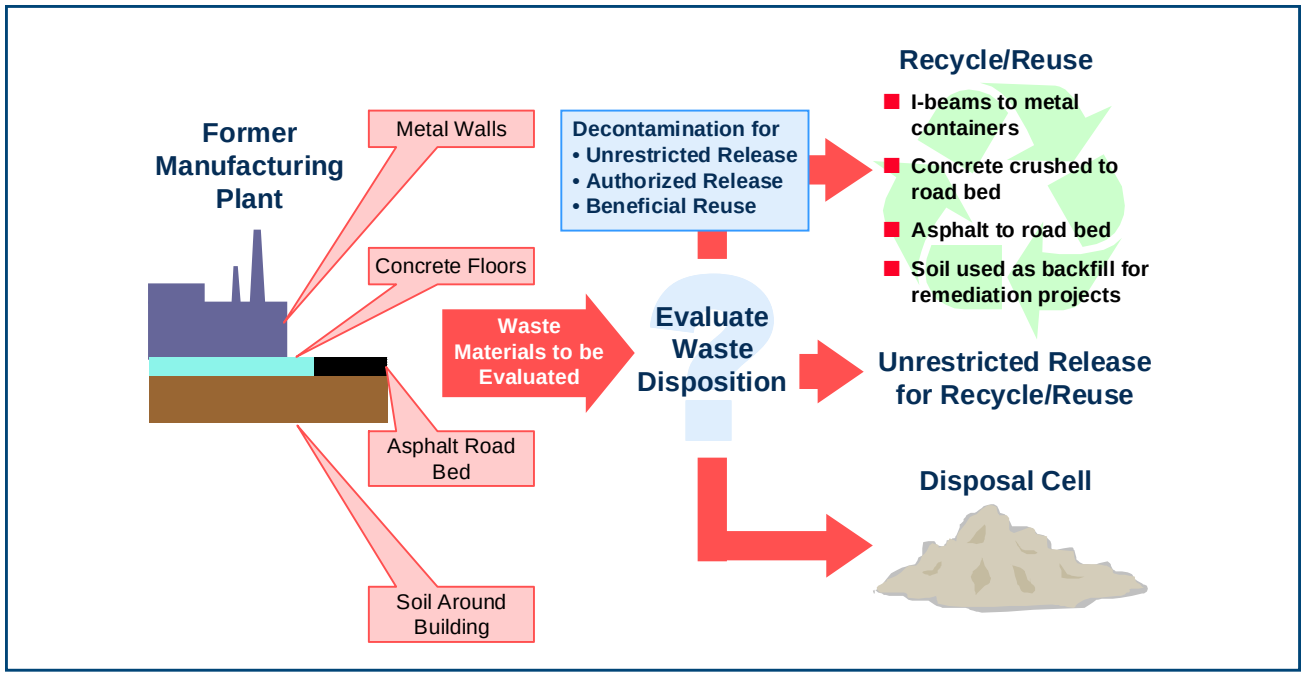


Figure 3.2 Recycle/Reuse of Primary Waste from Decommissioning Activity

of materials. By shrinking and/or eliminating controlled areas, the amount of materials requiring disposal because they are suspect is minimized, the use of personal protective equipment is reduced, and the cost for managing these areas is greatly decreased.

BMPs generally focus on housekeeping measures and management techniques intended to prevent contact between pollutants and water media as a result of spills, leaks, or improper waste disposal. Depending upon the applicable regulations, BMPs may include a broad range of P2/WMin techniques, such as production modifications, operational changes, material substitutions, materials and water conservation, and other similar measures, each of which reduce waste generation at the source. BMPs, in conjunction with other P2/WMin techniques, maximize the benefits of P2/WMin.

3.4.2 Recycle/Reuse

Recycle/reuse provides the most viable P2/WMin benefits for cleanup activities, particularly during decommissioning. Recycling and reusing materials saves valuable disposal capacity and the costs associated with disposal. Many waste materials that are recycled or reused, such as scrap metal, have an intrinsic value which can be leveraged to reduce overall project costs. In some instances, materials will be capable of being surveyed for unrestricted release. Other materials will first need to be decontaminated prior to recycle/reuse, and can then be surveyed for unrestricted release, approved for authorized release, or beneficially reused onsite. Figure 3.2 depicts a schematic process diagram of primary waste recycle/reuse.

3.4.3 Treatment

The choice of treatment is important in reducing waste during cleanup. As stated earlier, the decision to use in situ treatment technologies over ex situ treatment has a direct effect on the volumes of wastes excavated, treated, and disposed. Although the decision to use an in situ or passive treatment technology does not necessarily result from a desire for P2/WMin, the result is indeed correlated to waste volume reductions.

Treatment, in the form of **volume reduction**, is not generally considered a P2/WMin technique; but, for cleanup operations, it does reduce the *volume* of waste destined for disposal. Reducing waste volumes by compaction, evaporation, shear-

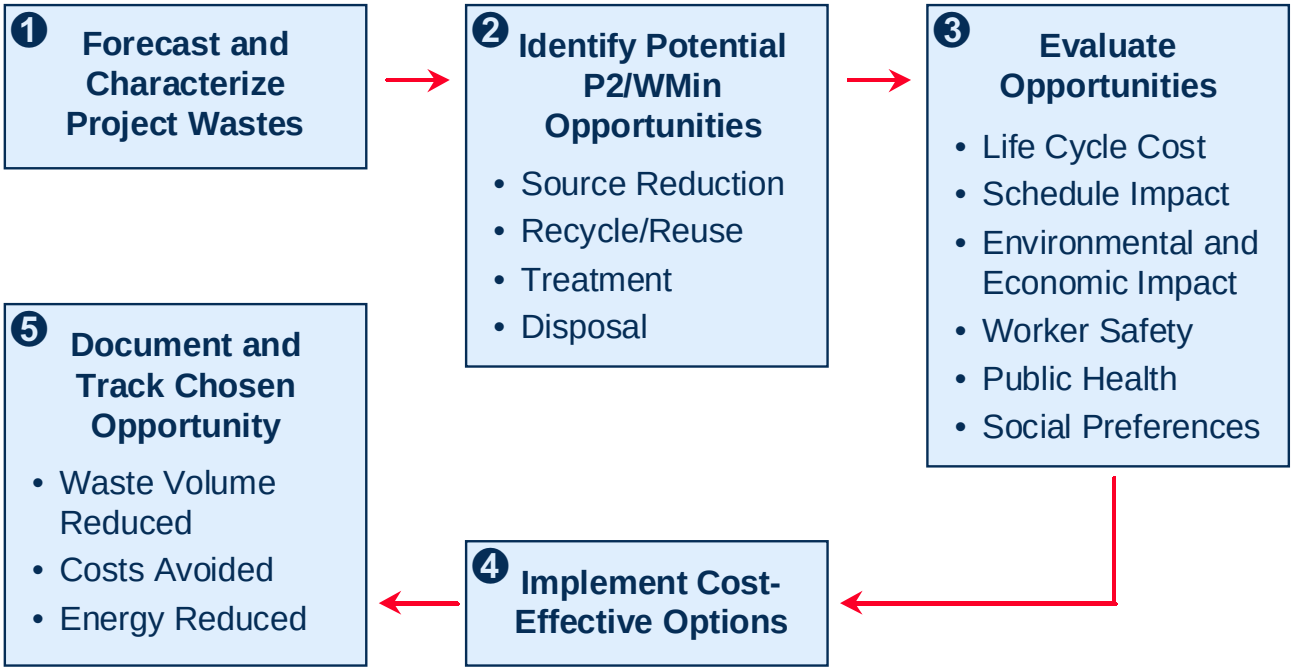
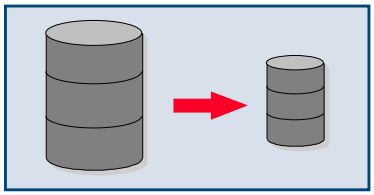


Figure 3.3 Project P2 Evaluation Flow Diagram

ing, or crushing can result in a reduction in overall waste disposal costs. Volume reduction of



wastes also results in the need for less packaging e.g., fewer drums, boxes, and filler materials such as absorbants, it also lowers transportation costs due to fewer trips/loads. Treatment methods also determine the degree to which hazardous, radioactive, and nonhazardous materials can be segregated. Thus, the treatment choice is a very important step in identifying methods to minimize waste volumes.

3.4.4 Disposal or Interim Storage

Disposal or interim storage onsite is the last option in the waste management hierarchy. Choices made in the type of disposal or storage facility may determine the most cost-effective location for the waste. Careful consideration should be given to disposal and all the costs associated with the packaging, handling, placement, surveillance, and other activities performed when disposing of wastes.

3.5 Integrating P2/WMin into ER Projects

Integrating P2/WMin into ER projects is performed by looking at the project life-cycle from the aspect of the waste. ER project managers are faced with budgetary, regulatory, and scheduling pressures, and generally do not evaluate the impact that waste generation has on these issues. Waste evaluations or Pollution Prevention Opportunity Assessments (PPOAs) identify P2/WMin techniques that can be applied to significant project waste streams, resulting in lower waste management costs. The process for integrating P2/WMin into ER projects consists of five steps as outlined in Figure 3.3.

- Define/estimate project waste volumes, types, and disposal costs;
- Identify potential P2/WMin techniques to reduce the volume of waste and/or number of waste stream(s);
- Evaluate opportunities;
- Implement cost effective options; and
- Track and document the results.

It is important to lay out a logical sequence for ER project managers and project teams to follow when looking for ways to reduce large-volume, high-cost waste streams. This is done by looking at each project phase separately and identifying the normal sequence of actions used to evaluate potential P2/WMin initiatives. The four project phases consist of Planning and Negotiations, Assessment, Evaluation and Selection, and Implementation. Each will be discussed in the sections below and will include references to various tools and resources described in Section 4.0.

3.5.1 Planning and Negotiations

The Planning Phase of projects offers the most valuable (higher percentage of cost saving potential) opportunities for P2/WMin. Once the regulators and stakeholders have determined that a cleanup project should commence, the project manager should assemble a project team. The team should consist of qualified ER and waste management professionals who will review, and direct the project activities. The project manager and team will influence the integration of P2/WMin into project work and should be fully trained on the benefits of P2 and the methods for incorporating P2 techniques into the environmental restoration process. This can be accomplished by using the training modules "*P2 Training Modules for Project Managers and Project Teams*."

Training modules are tools that have been developed by EM-40 to provide environmental restoration personnel with the P2/WMin knowledge and resources needed to reduce waste generation during a project and to achieve cost savings and project efficiencies. The *Project Manager Module* is focused on the concerns that a manager may have, such as costs, schedules, or regulatory compliance issues. The training provides the managers with the information needed to document P2/WMin successes; incorporate P2 into contract language and procurement initiatives; promote P2 within the project; and link and reference applicable documents, Web sites, and case studies. The training is short--approximately 30 minutes.

The *Project Team Module* includes more in-depth discussions on techniques and methods for incorporating P2/WMin into each project phase, and provides the necessary linkages between actual project activities and P2 opportunities. A video is also shown during the training to highlight several projects which utilized P2 principles to realize cost savings. The project team training runs approximately two and a half hours.

The project team, as well as the project manager, should use this document, *Pollution Prevention and Waste Minimization Guidance for Environmental Restoration Activities*, as a framework and resource for executing a project while incorporating P2/WMin into each phase.

The project team can also utilize numerous other documents, such as site historical information and past activity documentation, to develop a project plan where the project scope, cost, and schedule are outlined. At this point, forecasted waste generation data should be updated, reviewed and studied for potential P2/WMin opportunities. By studying this information, large-volume, highly regulated wastes can be identified for future evaluation.

Waste and Material Disposition Maps, provided as part of the *Paths to Closure* document, can be used to understand each site's conceptual approach to managing wastes, nuclear materials and contaminated media. Other information sources on forecasted waste volumes include the EM-40 Core Database which has been rolled into the Integrated Planning, Accountability and Budgeting System (IPABS). Several material/waste management models are available that provide credible and detailed waste volume estimates (primary and secondary), and the associated cost estimate, based upon the approved project scope. Waste treatment and disposition option scenarios can be varied in order to view the corresponding change to waste volumes and cost.

During the project Negotiations Phase, the project team should have a clear definition of the cleanup standard to be met and, if appropriate, the approved release criteria. These two items directly affect the amount of material/waste which will be removed, decontaminated, treated, and/or disposed. Careful consideration should be given to

Table 3.1 – P2 Tools Available During Planning and Negotiations

P2 Tools	When to Use	Benefits
P2 Project Team Training Modules and Video; P2 in ER Guidance Document	Prior to project initiation	Project team aware of P2 potential and opportunities
P2 expert on team	When reviewing drawings, site information, past activities, etc. for P2 opportunities	Ensures accurate accounting of waste generation
P2 in ER Case Study Database	Search for examples of successful P2/WMin techniques	Ensures use of proven P2 techniques
Handbook for Controlling Release for Reuse or Recycle of Non-Real Property Containing Residual Radioactive Material	When planning or negotiating with regulators regarding potential release of non-real property	Provides step-by-step process for sites to use to meet regulatory standards for release of material for recycle/reuse
Material/waste management models; IPABS; EM-40 Core Database	When determining waste forecast data	Identifies high-volume, highly regulated waste streams for future evaluation
Project procedures	Develop procedures after evaluating P2/WMin opportunities and incorporating P2 techniques and practices	Ensures P2 techniques are included in all procedures

these discussions and the ideas of risk-based closures and flexible Records of Decisions; the approval of a free-release standard should be arbitrated. The *Handbook for Controlling Release for Reuse or Recycle of Non-Real Property Containing Residual Radioactive Material* should be used to assist sites in assessing if these types of materials can meet the applicable regulatory standards for offsite release prior to recycle or reuse.

The *P2 in ER Case Study Database* can be used to identify examples of successful P2/WMin integration efforts from across the complex. All of the decisions reached, as well as the P2 techniques and methods decided upon, should then be integrated into the project procedures.

Table 3.1 summarizes the P2 tools available during Planning and Negotiation Phase activities.

3.5.2 Assessment

During the Assessment Phase of projects, it is important for the project team to thoroughly evaluate all sampling and analysis and characterization procedures, and identify techniques for reducing secondary waste generation. This phase of a project offers opportunities to directly affect the amount of investigative-derived waste (IDW) generated by utilizing segregation techniques, modifying decontamination procedures, evaluating statistical sampling methods, using innovative sampling and drilling techniques such as micropurging, and employing sound engineering practices.

The use of the *P2 in ER Case Study Database*, the *Argonne WMin Handbook*, and the *DOE Lessons Learned Database* will assist project teams in identifying successful techniques deployed during similar projects throughout the complex.

Table 3.2 – P2 Tools Available During Assessment

P2 Tools	When to Use	Benefits
P2 expert in project team approach	When assessing project boundaries and determining amount of sampling needed	Reduce size of area to be sampled and amount of samples needed (secondary wastes)
Utilize P2 in ER Case Study Database, WMin Handbook, and DOE Lessons Learned Database	When identifying P2/WMin techniques for reducing Investigative Derived Waste (IDW) generation and secondary waste	Reduces IDW and secondary waste generation; reduces cost and improves schedule
Environmental Restoration P2 Information Management System (ER P2 IMS)	To track waste reductions and document successes	Provides data for reporting P2 successes in annual reports and in progress toward Strategic Plan goals

The Environmental Restoration P2 Information Management System (ER P2 IMS) should be used to track actual waste reductions against projected waste volumes. This will provide a means to report successful waste minimization and P2 activities in DOE's Annual Report of Waste Generation and P2 Progress, as well as report progress toward the Strategic Plan goals.

Table 3.2 summarizes the P2 tools available during Assessment Phase activities.

3.5.3 Evaluation and Selection

The Evaluation and Selection Phase of a project consists of evaluating the most effective remedy for cleaning a contaminated site or building and determining what treatment method will be used. Waste reduction opportunities should be evaluated with regard to secondary waste that might be generated during bench- or pilot-scale treatment operations and, also, during the evaluation of cost-effective recycle/reuse options for waste materials.

Several P2 tools can be utilized to perform these evaluations. A Pollution Prevention Opportunity Assessment (PPOA) can be performed on the selected treatment technology to determine the opportunities for eliminating or reducing secondary waste generation and to examine ways to maximize the technology in terms of waste minimization. *The TechKnow Database*, and the *Preferred Alternatives Matrix* can also be used as resources for identifying potential P2/WMin techniques which have proven successful.

The As Low As Reasonably Achievable, (ALARA) Analysis must be used to compare the cost, risk, and benefits attributable to various waste management techniques. Residual Radioactivity-Recycle (RESRAD-RECYCLE) Analysis should be used as a model to assess radiological doses resulting from the recycle of contaminated material and the reuse of contaminated equipment.

The Life-Cycle Decision Methodology, developed by Oak Ridge National Laboratory, is a decision-aiding framework used to support P2 decision-making for the disposition of materials. The Decision Methodology identifies and assesses all of the impacts (benefits, costs, and other externalities) that result from a course of action over the entire period of time affected by the action. This methodology has been successfully applied at several sites to support the decision to recycle/reuse structural steel, copper, scrap metal, soil, and concrete.

Table 3.3 summarizes the P2 Tools available during Evaluation and Selection Phase activities.

3.5.4 Implementation

Finally, the project will move into the Implementation Phase which involves actual field activities. This is where all of the previous planning for waste reductions is tested. Contracts to em-

Table 3.3 – P2 Tools Available During Evaluation and Selection

P2 Tools	When to Use	Benefits
Pollution Prevention Opportunity Assessment, TechKnow database, DOE's Preferred Alternatives Matrix	Use when identifying where waste is coming from, why and how, and the type/volume of wastes generated from bench- and pilot-scale treatment studies	Identifies methods and techniques for reducing waste (primary and secondary) from selected technology
ALARA Analysis	Use as an analysis to compare the cost, risk, and benefits attributable to various waste management techniques	Balances cost, risk and benefits of various alternatives
RESRAD-RECYCLE Analysis	Use as a model to calculate radiological doses resulting from the recycle of contaminated material	A user-friendly format for communicating risk of recycle or reuse to the public
Life-Cycle Decision Methodology	Use to identify waste disposition alternatives	Provides defensible data for choosing recycle/reuse or other dispositions based upon cost, risk **and** other externalities

ploy the services of a subcontractor are usually issued at this time. It is important to include P2 language in these contracts to ensure that all subcontractors are aware of P2 requirements. Adding incentives to the contract for accomplishing actual waste reductions and tracking of these successes can result in contractors exhaustively seeking ways to minimize wastes. DOE has collected standard P2 contract language which can be accessed from the DOE P2 in ER Web page at **www.em.doe.gov/p2/index.html**.

The Environmental Restoration P2 Information Management System (ER P2 IMS) should be used to track successful waste reductions against the project baseline. This will provide a method for retrieving this information for reporting purposes as well as assessing progress toward the Strategic Plan goals.

Table 3.4 summarizes the P2 tools available during Implementation Phase activities.

Table 3.4 – P2 Tools Available During Implementation

P2 Tools	When to Use	Benefits
Standard P2 contract language	Use when developing/writing contracts. Look for incentives to reduce waste generation, maximize recycle/reuse, etc.	Sub-contractors are required to evaluate P2/WMin potential and track waste reduction
P2 in ER Case Study Database, DOE's Lessons Learned Database, P2/WMin Users Guide for ER Projects	Use when assessing work practices for generation of unnecessary waste and cross-contamination potential	Reduces the generation of secondary wastes from the work area
ER P2 IMS	Use to track waste reductions and document P2 successes	Provides documentation for annual reports and progress toward Strategic Plan goals

Reevaluating work procedures and practices is essential both prior to commencing the work and on a daily basis. By using the *P2 in ER Case Study Database*, *DOE's Lessons Learned Database*, and the *P2/WMin Users Guide*, numerous opportunities can be identified, such as shrinking the size of contaminated areas by decontamination, controlling the access to contaminated areas, using washable Personal Protective Equipment (PPE), evaluating waste packaging procedures to ensure optimization, and segregating all materials and wastes.

4.0 P2/WMin Tools and Resources

The increased emphasis being placed on implementing P2/WMin opportunities within ER activities has created the need to accumulate and separate the numerous tools, documents and on-line data resources dealing with P2/WMin. The information must also be catalogued to provide the most appropriate and useful resources for use in ER settings. This section of the Guidance Document will discuss and categorize the myriad of information available on P2/WMin and provide a mechanism to make it readily available to ER project personnel.

P2 in ER Tools and Resources have been grouped together in categories corresponding to the type of information they provide. The categories include reference documents (Table 4.1), technical resources (Table 4.2), information resources (Table 4.3), and contacts/experts (Appendix B). This section of the Guidance Document lists these tools and resources in table format and provides a brief description of the item, as well as information on how it can be accessed. Each tool and/or resource is also described in **Appendix A.**

Table 4.1 – P2/WMin Reference Documents

Document	Description	How to Access
Complex-Wide Study on the Successful Integration of P2 in the ER Program	Two-volume report discussing how P2 can be integrated into ER activities. Volume II includes 92 Case Studies of successful P2/WMin applications at 26 DOE sites.	**http://www.em.doe.gov/p2/study.html**
Handbook for Controlling Release for Recycle or Reuse of Non-Real Property Containing Residual Radioactive Material	A step-by-step guide to assist sites in meeting DOE requirements for free-release of these types of materials.	**http://www.em.doe.gov/recyc/guidintr.html**
Decommissioning Resource Manual	Provides complete regulatory and project management guidelines on how to decommission facilities.	**http://www.em.doe.gov/dd/decresma.html**
Ohio Field Office's P2/WMin Users Guide for ER Projects	A user-friendly tool with step-by-step guidelines and worksheets that direct the integration of P2/WMin practices into ER projects.	**http://apollo.osti.gov:801/p2wmin/home.html** *Interactive Site*
DOE 1996 Pollution Prevention Program Plan	Establishes waste reduction/recycling goals for DOE including recycling of sanitary waste from ER activities.	**http://eagle.emweb.icx.net/wastemin/plan.html** *Executive Summary*
Facility Deactivation Guide Methods and Practices Handbook	Provides complete regulatory and project management guidelines on how to deactivate facilities.	**http://www.em.doe.gov/facdeat/**

Table 4.2 – P2/WMin Technical Resources

Technical Resource	Description	How to Access
P2/WMin Training for ER Personnel	P2/WMin training and awareness modules developed for ER project managers and project teams. The two modules can be customized for individual sites.	Site Waste Minimization Coordinators
Video: "Tooling up for Success"	Fifteen-minute awareness video to inform ER project personnel on the benefit of deploying P2/WMin into projects.	Site Waste Minimization Coordinators
Pollution Prevention Opportunity Assessment Training	A 2-day comprehensive training course focusing on using performance-based methods to complete waste assessments on waste streams.	DOE National Environmental Training Organization (NETO) **http://www.em.doe.gov/neto/**
Remediation Technologies Screening Matrix and Reference Guide	Searchable database which allows remediation technology to be matched to a contaminant type and medium. Provides cost estimates and a ranking on effectiveness and waste generation.	**http://www.frtr.gov/matrix2/top_page.html**
WMin Handbook, Volume I	Technical guide listing technologies which minimize ER waste streams.	**http://www.td.anl.gov:80/d&d/html/anl_d&d_tm-96_1.html**
Preferred Alternatives Matrices	Provides preferred alternative technology descriptions and crosswalks.	**http://www.em.doe.gov/define/download.html**
Techknow Interactive Environmental Technology Database	Searches remediation technologies by contaminant, media, DOE site, and key words.	**http://www.gnet.org/empire/?SubSystemID=1&ComponentID=4936**
Vendor Information System for Innovative Treatment Technologies (VISITT)	Database which provides cost and performance data on HAZ Waste treatment technologies and the name of the associated vender of the technology.	**http://www.ttemi.com/visitt/**
Vendor Field Analytical and Characterization Technologies System (VendorFacts)	Database which contains information on characterization technologies and the vendor's name and address.	**http://www.clu-in.com/vfacts1.htm**
EPA Office of R&D Treatability Study Database	Provides performance information on innovative treatment technologies.	**http://www.epa.gov/bbsnrmrl/attic/ttdbn.html**
Innovative Treatment Remediation Demonstration (ITRD)	Lists innovative treatments being deployed throughout the DOE complex.	**http://www.em.doe.gov/itrd**

Table 4.2 – P2/WMin Technical Resources (Cont'd)

Technical Resource	Description	How to Access
DOE P2 by Design Project	Lists the tools developed to support engineers/designers and planners incorporate P2 strategies into design.	**http://epic.er.doe.gov/epic/html/P2Edge.sph**
Life Cycle Decision Methodology	ORNL-developed methodology for comparing waste disposition alternatives.	**http://ats.ornl.gov/lca/primer**
Technology Connection (TechCon) Program	Provides commercial remediation and treatment capabilities tailored to specific project cleanup requirements based on performance and system approaches. Ties to P2.	**http://www.ead.anl.gov/~techcon**
Material/Waste Management Model	Provides detailed waste volume estimates and associated cost estimates based on project scope	**http://www.em.doe.gov/recyc/**
P2/WMin Tracking Systems (ER P2IMS)	Microsoft Windows-based Access application that tracks and reports P2 techniques, cost savings and waste reductions.	**Contact Ana Gonzalez, Oak Ridge Operations Office (423) 241-4212**
P2/WMin in Contracting	Guidance on incorporating P2/WMin language into major ER contracts.	**http://www.em.doe.gov/p2/index.html**

Appendix A provides a detailed description of the tool or resource and identifies how it can be accessed and utilized. The tools discussed in Section 3.5 are included here and in Appendix A.

4.1 P2 in ER Homepage

Most of the tools and resources can be accessed from the EM-40 P2 in ER Homepage, accessible from the Internet at **http://www.em.doe.gov/p2/index.html**. The Homepage was designed to provide the user with direct links to various P2 in ER topical areas and provide easy access to P2 in ER tools and resources. The suite of information available from the Web Site will provide ER project managers and teams with the current, up-to-date information and resources needed to aggressively evaluate cleanup projects for P2/WMin opportunities. The Web Site also provides case studies of successful P2 in ER initiatives from across the complex as well as personal contacts at the sites for communication and networking possibilities.

The major topical areas accessible from the Homepage include the following:

- P2 in ER Guidance Document
- P2 in ER Case Studies
- Conference Papers and Workshops
- Training
- Bimonthly Conference Call Minutes
- P2 Experts
- Contract Language
- P2 in ER Tools, Resources, and Links

4.2 P2/WMin Reference Documents

There are numerous reference documents that help ER project personnel during key decision-making activities and show them how to integrate P2 or other cost-saving initiatives into an ER project. Many of the documents are targeted at specific types of restoration projects or issues. Most of the documents listed in Table 4.1 can be obtained in hardcopy or downloaded from the Internet.

Table 4.3 – P2/WMin Information Resources

Technical Resource	Description	How to Access
P2 in ER Bi-Monthly Conference Call	Information exchange call on P2 in ER. Minutes from calls on P2 in ER Homepage.	**http://www.em.doe.gov/er/**
National Metals Recycling Center of Excellence	Promotes the recycle/reuse of radioactive scrap metal.	**http://www.em.doe.gov/recyc/**
DOE Environmental Pollution Prevention Information Clearinghouse (EPIC)	Database which provides general information on P2/WMin	**http://epic.er.doe.gov/epic/**
DOE Lessons Learned Database	Provides lessons learned documents from DOE and DOE contractors. Performs searches.	**http://nattie.eh.doe.gov/others/ll/ll.html**
Remedial Action Program Information Center (RAPIC)	An environmental literature seach service. Contains reports, articles, patents, etc.	**http://www.em.doe.gov/rapic/index.html**
DOE Information Bridge	Contains the full-text and bibliographic records of DOE-sponsored reports. Searchable.	**http://www.doe.gov/bridge**
Global Network of Environmental Technology (GNET)	Updated profiles and case studies on environmental technologies.	**http://gnet.together.org/**
EPA Enviroene	Informational site on P2/WMin in general.	**http://es.eps.gov/index.html**
Solvent Alternatives Guide (SAGE)	Comprehensive guide providing P2 opportunities for cleaning and degreasing activities.	**http://clean.rti.org**
TechDirect	Monthly e-mail service that updates available technical publications relevant to cleanup.	**http://clu-in.com**
DOE Workshops and Proceedings	Provides updated abstracts and proceedings on P2 in ER from various workshops, symposia, and conferences.	**http://www.em.doe.gov/er**

4.3 P2/WMin Technical Resources

Many opportunities for integrating P2/WMin into ER projects are connected with defining the appropriate remedial objective and then evaluating, selecting, and implementing appropriate technologies that result in the desired project endpoint. Over the years, DOE has invested in technology development and deployment to provide viable solutions to DOE technology needs.

Cost can be a major factor in the selection of remedial alternatives. Waste management costs are often a major portion of the total project cost. DOE has supported the use of training, life-cycle assessment, value engineering, activity-based costing, and other project management tools to ensure ER projects are efficiently and effectively managed. As a result, technology and project management tools are significant resources for integrating P2 into ER projects.

4.4 Information Resources

DOE has been a strong promoter of developing and sharing information from both successful and unsuccessful projects in the form of lessons learned databases, case studies, and technical exchange conference calls and workshops. These materials and forums provide an opportunity for project personnel to benefit from the experiences gained in planning and implementing similar or related projects. The materials available from the databases are generally just abstracts or briefs discussing the project and serve as an initial mind-jogger for evaluating current projects in light of the information presented. The databases and case studies usually provide personal contact names and phone numbers so that project personnel can initiate technical dialogue and exchange information.

4.5 P2 in ER Contact List

The P2 in ER contact list provides a listing of P2 in ER experts across the complex, along with their phone numbers, fax numbers, and e-mail addresses. These contacts provide experience in P2/WMin, as well as in ER project management and implementation, and should be used as an information resource that allows direct contact with personnel who understand how to integrate and deploy P2/WMin. Refer to Appendix B for a complete list of P2 in ER contacts.

Appendix A

P2/WMin Tools and Resources

Reference Documents

Numerous reference documents are available to inform ER project personnel and assist them during key decision-making activities that integrate P2 or other cost-saving initiatives into an ER project. Often the documents are targeted at specific types of restoration projects or issues. Most of the documents discussed below can be obtained in hardcopy or downloaded from the Internet.

1) *Complex Wide Study on the Successful Integration of P2 in ER*

The Complex Wide Study on the Successful Integration of P2 in ER is a two volume report that gives a "snapshot" view of DOE's successes in applying P2/WMin in ER. Volume I includes a programmatic summary of how P2 has been integrated at 19 sites across the DOE complex, summarizes the cost savings and waste avoidance from 92 P2/WMin case studies, and provides recommendations for maximizing the results of P2 in ER. Volume II provides detailed descriptions of 92 case studies collected from 26 different sites. Accessible on the P2 in ER Home Page at **http://www.em.doe.gov/p2/study.htm1**.

2) *Handbook for Controlling Release for Reuse or Recycle of Non-Real Property Containing Residual Radioactive Material*

The *Handbook* provides a step-by-step process that, if followed, will assist sites in ensuring that non-real property containing residual radioactive material meets applicable regulatory standards and meets DOE requirements for release prior to recycling or reuse outside of DOE facilities. The document can be accessed through the Internet at **http://www.em.doe.gov/recyc/guidintr.htm1**.

3) *Decommissioning Resource Manual*

The *Manual* provides regulatory and project management guidelines on how to complete the decommissioning of facilities in a timely, safe, cost-effective manner. Available on the Internet at **http://www.em.doe.gov/dd/decresma.html**.

4) *P2/WMin Users Guide for ER Projects (Ohio Field Office)*

The *P2/WMin Users Guide for ER Projects*, developed by the Ohio Field Office, is a tool designed to assist project managers and project teams identify, evaluate, and implement P2 opportunities in ER projects. It is a coordinating tool which ties together existing resources that are relevant to ER projects. The User's Guide is a user-friendly tool with guidelines and worksheets that direct the integration of P2/WMin options into the planning and sequencing of D&D. The format of the guide takes a project team through a sequential process that details the P2/WMin approach and how it is evaluated and implemented during project planning, decision analysis, characterization, and final disposition. The Users Guide can be accessed from the Internet at: **http://apollo.osti.gov:801/p2wmin/home.html**.

5) *DOE 1996 Pollution Prevention Program Plan*

This document serves as the principle crosscutting guidance to DOE HQ, Operations Offices, laboratory, and contractor management to fully implement P2/WMin programs throughout the complex. The document includes the DOE-wide waste reduction goals established by the Secretary of Energy in May 1996 to be achieved by December 31, 1999. The Internet site provides the Executive Summary at **http://eagle.emweb.icx.net/wastemin/plan.html**.

6) *Facility Deactivation Guide - Methods and Practices Handbook*

The web site gives the Introduction to the *Guide* and allows the *Guide* to be downloaded. The Internet site is **http://www.em.doe.gov/facdeact/**.

Technical Support

Many opportunities for integrating P2/WMin into ER projects are connected with defining the appropriate remedial objective and then evaluating, selecting, and implementing appropriate technologies that result in the desired project endpoint. Over the years, DOE has invested in technology development and deployment to provide viable solutions to DOE technology needs. Cost can also be a major factor in the selection of remedial alternatives. Waste management costs are often a major portion of the total project costs. DOE has supported the use of training, life-cycle assessment, value engineering, activity-based costing, and other project management tools to ensure ER projects are efficiently and effectively managed. As a result, technology and project management tools are significant resources for integrating P2 into ER projects.

1) Training

- **ER Project Team Training**

  The ER Project Team Training module was developed to provide effective guidance to ER project teams on incorporating and documenting P2/WMin techniques into ER activities. The training can be tailored with site-specific information and has a running time of two and a half hours. For more information on this training module, contact your site WMin Coordinator or Lisa Allmon-Burns, at (513) 782-4513, e-mail address lallmon@itcrp.com.

- **ER Project Manager Training**

  The ER Project Managers Training module is a scaled down version of the ER Project Team Training discussed above. The training module provides a brief overview of P2 in ER, but focuses on current program drivers, tracking initiatives, reporting requirements, and P2 resources. For more information on this training module, contact your site WMin Coordinator or Lisa Allmon-Burns at (513) 782-4513.

- **Video: "Tooling Up for Success"**

  This video is designed to train/inform project personnel and subcontractors in order to create an awareness and culture of P2 during ER projects. The 14-minute video describes examples of P2 in ER from around the complex. Copies of this video can be obtained form your site WMin Coordinator or by contacting Lisa Allmon-Burns at (513) 782-4686.

- **Pollution Prevention Opportunity Assessment (PPOA) Training**

  The PPOA training is a two-day, comprehensive training series sponsored by DOE-HQ, EM-77, and NETO. The training uses performance-based methods in conjunction with a set of worksheets to structure and perform PPOAs. Exercises have been developed as part of the performance-based teaching style. Separate breakout sessions are utilized to introduce participants to a microprocessor-based system (both Macintosh and IBM compatible) that can be used to record and retrieve PPOA information. This training can be obtained at no cost for DOE personnel. For more information contact NETO – Savannah River Site, (803) 725-0814 or **http://www.em.doe.gov/neto/**.

2) Environmental Technologies

- **Remediation Technologies Screening Matrix and Reference Guide**

  The Remediation Technologies Screening Matrix and Reference Guide is a database that contains a screening matrix which allows remediation technology to be matched

to a contaminant type and medium. Each technology is explained with cost estimates, points of contact, site information, vendors, and reference materials. The technologies are also ranked based on cost effectiveness and waste generation. The information provided includes an index of Federal Remediation Technologies Roundtable (FRTR) Costs and Performance Technology Application Analysis Reports Abstracts and links to contaminant specific web sites. A search engine is available for key word searches. The Remediation Technologies Screening Matrix and Reference Guide can be accessed on the Internet at **http://www.frtr.gov/matrix2/top_page.html**.

- **WMin Handbook, Volume 1**

  The WMin Handbook is a technical guide published by Argonne National labs that lists technologies to minimize ER waste streams. To obtain a copy of the guide, call (423) 576-8401 and ask for document ANL/D&D/TM-96/1. Further information is available at **http://www.td.anl.gov:80/D&D/html/anl_d&d_tm-96_1.html**.

- **Preferred Alternatives Matrices**

  The complete DOE Preferred Alternatives Matrices (PAMs) for Remediation/Waste Processing and Decommissioning includes introduction and background, technology descriptions, PAM tables, and technology crosswalks. Written in a WordPerfect 6.1 and Excel format, the document must be downloaded from **http://www.em.doe.gov/define/download.html**. The Characterization PAM will be available at a later date.

- **TechKnow Interactive Environmental Technology Database**

  TechKnow searches remediation technologies by: contaminant, media, DOE sites, name, frtr, tsf, and general keywords. Queries return descriptions of technologies that include costs, vendors, and points of contact as well as the queried information. To enter TechKnow as a guest (i.e. without registering) login as User Name: "techuser" and Password: "guest." The TechKnow Database can be found at **http://www.gnet.org/empire/?SubSystemID=1&ComponentID=4936**.

- **Vendor Information System for Innovative Treatment Technologies (VISITT)**

  The US EPA Technology Innovation Office has developed a database that provides cost and performance data on more than 375 hazardous waste treatment technologies. VISITT 6.0 contains detailed information, provided by 214 vendors, that enables users to screen and assess remediation technologies quickly. The information options provided for each technology include: vendor name, technology type, trade name, vendor address, contact name/phone number, SITE program information, patent/trademark information, and scale of technology (bench, pilot, or full). Use of the system requires downloading the entire database, but this enables users to build queries according to the conditions at the user's site via numerous types of search criteria. The system can be downloaded off the Internet at **http://www.ttemi.com/visitt/**. A CD containing VISITT 6.0 will soon be available by calling 1-800-490-9198 or (513) 489-8190.

- **Vendor Field Analytical and Characterization Technologies System (VendorFACTS)**

  The VendorFACTS database contains information provided by over 115 vendors of technologies for site and waste characterization. The system includes approximately 150 technologies for the detection and quantification of priority pollutants in the air, soil, and water, as well as various screening technologies. The system allows individuals to gather information on the application, cost, performance, and current use of field-portable equipment. VendorFACTS is a Windows-based, menu-driven database that requires very little setup time and is available to download from **http://www.clu-in.com/vfacts1.htm**.

- **EPA Office of Research and Development (ORD) Treatability Study Database**

  The EPA ORD Treatability Study Database provides performance information on innovative treatment technologies based on data derived from treatability studies. In the future, performance and cost information from full-scale treatment systems will also be included. The database is currently only available through the ORD ATTIC (Alternative Treatment Technology Information Center) system at **http://www.epa.gov/bbsnrmrl/attic/ttdbn.html** or can be obtained on disk, free of charge, from the EPA. To obtain a copy of the Treatability Database v5.0, send a FAX (containing your name, phone number, and mailing address) to: Treatability Database; Attn: Jerry Waterman; (513) 569-7585.

- **Innovative Treatment Remediation Demonstration (ITRD)**

  The ITRD program is funded by EM-40 to help accelerate the adoption and implementation of new and innovative remediation technologies. A listing of technologies being deployed around the complex can be found at **http://www.em.doe.gov/itrd**.

- **DOE P2 by Design Project**

  The objective of the P2 by Design Project is to create an integrated set of tools to help engineers, designers, and planners incorporate P2/WMin strategies into the design stage of new products, processes, and facilities. The tools can be accessed at **http://epic.er.doe.gov/epic/html/P2Edge.sph**.

3) Analysis Tools

- **Residual Radioactivity-Recycle (RESRAD-RECYCLE) Analysis**

  RESRAD-RECYCLE Analysis is a tool developed by the Center for Risk Assessment as a Dose Assessment Model. This model assesses radiological doses resulting from the recycle of contaminated equipment. The model considers external exposure, inhalation, and ingestion pathways. Tabulations of individual, collective, and cumulative committed effective dose equivalents are provided by scenario, pathways, and radionuclides. **http://www.ead.anl.gov/~resrad/recycle.html**.

- **Life-Cycle Decision Methodology**

  The Life-Cycle Decision Methodology developed by the Oak Ridge National Laboratory is used to compare the waste disposition alternatives identified during or before an ER project commences. The methodology was developed to support the decision process for evaluating disposition alternatives for materials resulting from ER activities, and provides a sound basis for comparing and selecting among competing alternatives. The methodology also provides a process for evaluating the benefits and costs associated with each alternative on an equivalent basis. The *Decision Methodology* can be accessed at **http://ats.ornl.gov/lca/primer** or by contacting Kathy Yurako at (423) 241-2290.

4) Contracting

- **EM Guidance on incorporating P2 Principles into the Contracting Process**

  DOE HQ has prepared sample language which has been inserted into major ER contracts in the past and can be used as a guideline for inclusion into new ER contracts. For a copy of the sample language see the **P2 in ER Web site at http://www.em.doe.gov/p2/index.html**.

5) Tracking

- **Environmental Restoration Pollution Prevention Information Management System (ER P2IMS)**

  The ER P2IMS is a Microsoft Windows-based Access 95 application that provides users with a centralized information manage-

ment system that tracks and reports P2 techniques, resulting cost savings, and generated waste reductions or avoidance. DOE Oak Ridge has developed this database for use complex wide. P2IMS tracks the following six components of a P2 initiative: goals, performance measures, data entry, PPOA records, justification records, and reports. The information necessary for the six components is integrated into one relational database system, ensuring consistency while also making the information easier to maintain. For more information on this system contact Ana Gonzalez at (423) 241-4212 or by e-mail at gonzalezal@oro.doe.gov.

Information Resources

DOE has been a strong promoter of developing and sharing information from both successful and unsuccessful projects in the form of lessons learned databases, case studies, and technical exchange conference calls and workshops. These materials and forums provide an opportunity for project personnel to benefit from the experiences gained in planning and implementing similar or related projects. The materials available from the databases are generally just abstracts or briefs discussing the project and serving as an initial mind-jogger for evaluating current projects in light of the information being viewed. The databases and case studies usually provide personal contact names and phone numbers so that project personnel can initiate technical dialogue and exchange information.

1) ER/P2 Bi-Monthly Conference Calls

A bimonthly conference call, hosted by DOE/EM-40, allows P2/WMin and ER project personnel from across the complex to share ideas and successes regarding P2/WMin integration into ER. The calls typically last an hour and feature a 15-minute guest speaker followed by questions. Additionally, a roundtable discussion is held where attendees can share ideas and obtain technical information. Contact Bob Fleming at (301) 903-7627 or at robert.fleming@em.doe.gov to be included on the call. Minutes are accessible from the P2 in ER Homepage at **http://www.em.doe.gov/er**.

2) National Metals Recycling Center of Excellence

The vision of this program is to develop a DOE culture that considers the recycle/reuse of radioactive scrap metal as the first and primary disposition option and burial as the last option. The program is promoting several tools including ALARA analysis, risk and dose assessment models, independent government estimate models, material/waste management model, inventory flow diagrams, P2 tracking systems, life-cycle assessment, case studies, sample contract language, and service model contracts. For more information on this program contact Vince Adams, DOE-ORO, at (423) 576-1803; or Marvin Bennett, DOE-ORO, at (423) 576-0853. The policy statement can be viewed at **http://www.em.doe.gov/recyc/**.

3) DOE - Environmental Pollution Prevention Information ClearingHouse (EPIC)

The EPIC Database provides general information regarding P2, as well as a listing of the applicable regulations. Additionally, the site provides information on many other government, educational, and commercial Web sites containing P2 materials. EPIC can be accessed at **http://epic.er.doe.gov/epic/**.

4) U.S. Department of Energy Lessons Learned Information Services

A search engine is available to quickly find applicable documents. The lessons learned index can be found at **http://nattie.eh.doe.gov/others/ll/ll.html**.

5) Remedial Action Program Information Center (RAPIC)

RAPIC is an environmental literature search service provided by Oak Ridge National Laboratories, free of charge, to all DOE and DOE contract personnel. Individuals can make request via an electronic

form located on the service's Web page. Both government and commercial databases containing technical reports, conference papers, journal articles, patents, and theses relevant to ER activities are searched. To access the system, an application form located on the center's Web page must be completed and submitted electronically. RAPIC can be accessed at **http://www.em.doe.gov/rapic/index.html**.

6) DOE Information Bridge

This Web site includes the full-text and bibliographic records of DOE-sponsored report literature. It includes over 1.4 million searchable pages in 25,000 reports. Access at **http://www.doe.gov/bridge**.

7) Global Network of Environmental Technology (GNET)

GNET offers frequently updated profiles and case studies on environmental technologies. GNET is sponsored by the Federal Energy Technology Center and the DOE Office of Science and Technology. The Internet address is **http://gnet.together.org/**.

8) EPA Enviroene

This Web site is part of U.S. EPA's Web site and contains information sources and databases such as the P2 Vendor Database (VendInfo). The Internet address is **http://es.epa.gov/index.html**.

9) Solvent Alternatives Guide (SAGE)

SAGE is a comprehensive guide designed to provide pollution prevention information on solvent and process alternatives for parts cleaning and degreasing. The system evaluates a process based on the user's responses to a set of questions. It then provides a list of ranked alternatives with links to more information about those alternatives. Online reports can be generated at **http://clean.rti.org**.

10) TechDirect

TechDirect is a monthly e-mail service that provides information on the availability of new technical publications relevant to the environmental remediation field. For subscription information, contact TechDirect on the Cleanup Information (CLU-IN) home page at **http://clu-in.com**.

11) DOE Workshops and Proceedings

P2/WMin workshops are held at various conferences and symposiums throughout the year to discuss P2 in ER issues in order to increase awareness of these programs within all ER organizations. Workshop proceedings specific to P2 in ER are available from the DOE P2 in ER. The homepage can be accessed at **http://www.em.doe.gov/er**.

Appendix B

P2 in ER Contact List

This P2 in ER list provides a listing of P2 in ER experts across the complex along with their phone numbers, fax numbers, and e-mail addresses. These contacts provide experience in P2/WMin as well as ER project management and implementation. The contacts should be used as an information resource that allows direct contact with personnel who understand how to integrate and deploy P2/WMin.

Name	*Location*	*Phone Number*	*Fax Number*	*E-mail Address*
Adams, Vince	DOE National Metals Recycle Program	(423)576-1803	(423)241-1926	adamsv@oro.doe.gov
Al-Daouk, Ahmad	West Valley Demonstration Project, P2 Lead	(716)942-4629	(716)942-4703	aaldaouk@wv.doe.gov
Allmon-Burns, Lisa	EM-40 Contractor - IT Corporation	(513)782-4686	(513)782-4663	lallmon@ITCRP.com
Altmeyer, Scott	RMI, Site P2 Coordinator	(440)993-2018	(440)993-1918	Not available
Amar, Ravnesh	ETEC, Site P2 Coordinator	(818)586-5243	(818)586-5169	Ravnesh.Amar@boeing.com
Andrews, Carolyn	B&W Mound Applied Technologies	(937)865-4147	(937)865-5037	Not available
Attiga, Salem	LEHR, Site P2 Coordinator	(925)939-0687		saa.ems1@ix.netcom.com
Baillieul, Tom	Battelle - Columbus	(614)760-7372	(614)424-3951	thomas.a.baillieul@em.doe.gov
Baker, Theresa	Brookhaven National Lab	(516)344-7504	(516)344-7776	teresa@bnl.gov
Beard, Anna V.	DOE Richland Operations Office	(509)376-7472	(509)372-1926	anna_v_beard@rl.gov
Belcher, Garyena	Paducah LMES, Site P2 Coordinator	(502)441-5055	(502)441-5177	belcherg@ornl.gov
Betsch, Mary	Hanford, Waste Management	(509)372-1627	(509)376-5560	mary_d_betsch@rl.gov
Bindokas, Antanas	DOE Chicago Operations Office	(630)252-2342	(630)252-2654	antanas.bindokas@ch.doe.gov
Bishop, Lee	Oak Ridge DOE, Metals Recycle Program	(423)241-6199	(423)241-1926	bishopml@oro.doe.gov
Boing, Larry	ANL, Site P2 Coordinator	(630)252-6729	(630)252-1885	lboeing@anl.gov
Britcher, Joe	RMI Environmental Services	(440)993-1976	(440)993-1918	joe_britcher@rmies.com
Brown, Dave	Kansas City, AlliedSignal, Sampling & Rem.	(816)997-4034	(816)997-5093	debrown@kcp.com
Buckland, Russ	INEL - Lockheed Idaho Technologies	(208)526-9813	(208)526-3370	Not available
Burke, Daniel	West Valley Nuclear Services Company	(716)942-4248	(716)942-2110	burked@wv.doe.gov
Burgin, Corrine	LLNL	Not available	Not available	burgin1@llnl.gov
Celeste, John	LLNL	(510)422-1685	(510)422-3469	celeste1@llnl.gov
Cellemare, Richard	SLAC	(650)926-3401	(650)926-3175	rcellamare@slac.stanford.edu
Chen, Sy	ANL, Free Release Protocol	(630)252-7695		chens@smtplink.dis.anl.gov
Cheng, Sam	Mound - DOE, Miamisburg	(937)865-4778	(937)-865-4489	sam.cheng@em.doe.gov
Collins, Adrian	ANL-West	(208)533-7643	(208)533-7344	adrian.collins@anlw.anl.gov
Cook, Gina	NTS/Bechtel Nevada, Site P2 Coordinator	(702)295-2985	(702)295-1420	cookgm@nv.doe.gov
Copeland, Alan	LLNL	(510)422-8188	(510)422-3800	alan.copeland@quickmail.llnl.gov
Dayman, Debra	LANL	(505)661-5720	(505)661-5222	deba@fimad.lanl.gov
Dutcher, Andria	Grand Junction Recycling Office	(970)248-7656	(970)248-6040	adutcher@gjpomail.doegjpo.com
DuVon, Doug	Hanford, Bechtel Hanford Inc.	(509)372-9182	(509)376-6350	douglas_k_duvon@rl.gov

Name	Location	Phone Number	Fax Number	E-mail Address
Dye, Albert	LANL	(505)667-4715	Not available	dyea@lanl.gov
Eide, Jim	Battelle - Columbus	(614)424-3785	(614)424-3528	Not available
Eshelman, Troy	LANL - GTS Duratek	(505)662-1329	(505)662-1398	eshelman@gtsduratek.com
Fields, Susan	LEHR, DOE Project Manager	(510)637-1608	Not available	susan.fields@oak.doe.gov
Fleming, Robert	DOE HQ, EM - 40	(301)903-7627	(301)903-3675	robert.fleming@em.doe.gov
Flora, Jeff	West Valley Nuclear Company, Inc.	(716)942-2189	(716)942-2110	floraj@WV.doe.wv
Foust, Dewayne	Oak Ridge - ETTP	(423)576-9926	(423)576-7668	fdo@ornl.gov
Frink, Neal	Contractor, Metals Recycle	(513)929-4500	(513)784-0567	nfrink@eos.net
Garber, David	Battelle - Columbus	(614)424-5821	(614)424-5575	garber@battelle.org
George, Dave	Rocky Flats - DOE Field Office	(303)966-5669	(303)966-4775	dave.george@rfets.gov
Goddard, Christine	Oak Ridge - IT Corporation	(423)694-7420	(423)690-3626	cgoddard@itcrp.com
Goldman, Tonya	LBNL - DOE Operations Office	(510)486-6344	(510)486-4710	tonya.goldman@oak.doe.gov
Gonzalez, Ana	Oak Ridge - DOE Oak Ridge Operations	(423)241-4212	(423)576-6074	gonzalezal@oro.doe.gov
Goode, George	Brookhaven National Laboratory, Site P2, Coordinator	(516)344-4549	(516)344-4549	goode@mail.sep.bnl.gov
Goodrich, Rebecca	LLNL	(510)423-8099	Not available	Not available
Gresalfi, Michael	Oak Ridge, Lockheed Martin - HQ Contact	(301)916-1136	(310)916-8699	i32@ornl.gov
Griffin, John	INEL - Lockheed Idaho Technologies	(208)526-6997	(208)526-2448	jdg@inel.gov
Griffith, Mike	SRS	(803)952-6428	(803)644-6922	Not available
Hall, Mary	Inhalation Toxicology Research Institute	(505)845-1076	(505)845-1198	Not available
Hancock, Kent	DOE HQ, EM-77	(301)903-1398	(301)903-1348	kent.hancock@em.doe.gov
Hartnett, Suzanne	LANL - Benchmark Environmental	(505)672-3656	(505)672-9598	slhartnett@lanl.gov
Hesch, Victor	LANL, Remediation and Soils	(505)667-2445	(505)667-1976	hesch@lanl.gov
Hoel, David	National Environmental Training Office	(803)725-0818	Not available	david.hoel@srs.gov
Houston, Christina	Albuquerque Operations Office	(505)845-5483	(505)845-6286	Not available
Howe, Bob	Brookhaven National Lab	(516)344-5588	(516)344-7776	howe@bnl.gov
Hughes, Michael	Hanford - Bechtel	(509)372-9644	(509)372-9117	Not available
Irwin, Eva	Oak Ridge, Y-12	(423)241-2581	(423)241-2857	Not available
Ischay, Chris	INEL - Lockheed Idaho Technologies	(208)526-4382	(208)526-1458	Not available
Javandel, Iraj	LBNL - DOE Operations Office	(510)486-6106	(510)486-8694	Ijavendel@LBL.gov
Johnson, Lyn	RMI - DOE Project Office	(216)993-2020	(216)993-1961	Not available
Johnson, Rob	SRS	(803)952-6410	Not available	Not available
Johnson-Robinson, Sherri	SRS - DOE SRS Operations Office	(803)725-5793	(803)725-3616	Not available
Kalar, Don	Fernald - Fluor Daniel	(513)648-4950	(513)648-5701	Don_Kalar@Fernald.gov
Katzman, Danny	LANL	(505)662-1318	Not available	katzman@fimad.lanl.gov
Keary, Phil	Kansas City, DOE Area Office	(816)997-7288	(816)997-7310	pkeary@kcp.com
Kidman, R. Lynn	LANL	(505)661-5227	(505)661-5222	kidman@lanl.gov

Name	Location	Phone Number	Fax Number	E-mail Address
King, Karin	Oakland Operations Office	(510)637-1638	(510)637-1646	karin.king@oak.doe.gov
Kitts, Scott	Battelle - Columbus	(614)424-3338	(614)424-3954	Not available
Korzun, Ed	SRS - DOE SRS Operations Office	(803)725-1589	(803)725-3616	edwin.korzun@srs.gov
Krstich, Michael	Fernald Contractor, D&D User's Guide	(513)697-6682	(513)697-6683	mak@fuse.net
Lehrter, Bob	Fernald - Fluor Daniel, Site P2 Coordinator	(513)648-4966	(513)648-5701	robert_lehrter@fernald.gov
Leitner, Randy	Rocky Flats - Kiser - Hill	(303)966-2537	(303)966-3578	leitner.randy@rftes.gov
Leo, Sandy	SNL, Livermore	(510)294-1476	(510)294-3418	atleo@sandia.gov
Ljungberg, Charles	INEL - DOE Idaho Operations Office	(208)526-0198	(208)526-1926	ljungbc@id.doe.gov
Lowery, Mike	Pantex Plant	Not available	Not available	mlowery@pantex.com
Luginbyhl, James	Pantex Plant	(806)477-6507	(806)477-7979	jluginby@pantex.com
Luhman, Mike	Pantex Plant, Site P2 Coordinator	(806)477-6863	(806)477-7979	mluhman@pantex.com
Mackmull, Stephen	SRS - DOE SRS Operations Office	(803)725-3817	(803)725-3616	stephen.mackmull@srs.gov
Manis, Lori	Oak Ridge - ETTP	(423)576-3893	(423)241-2533	i9x@ornl.gov
Manrod, Courtney	Bechtel Jacobs Oak Ridge, Site P2 Lead	(423)576-0146	(423)576-0423	PCE@ornl.gov
Maxwell, Dave	DOE Waste Min. Coordinator Rocky Flats	(303)966-4017	(303)966-4728	dave.maxwell@rfets.gov
Maynor, Doug	DOE Waste Min. Coordinator, Mound	(937)865-3986	(937)865-4402	doug.maynor@em.doe.gov
McBrien, Greg	DOE HQ, EM - 77	(301)903-1385	(301)903-1398	gregory.mcbrien@em.doe.gov
McConachie, Bill	LLNL, Statistical Sampling	(510)423-3501	(510)423-3800	mcconachie1@llnl.gov
McGeachen, Thomas	Princeton Plasma Physics Lab, Site P2 Lead	(609)243-2943	(609)243-3366	tmcgeachen@pppl.gov
McInroy, Dave	LANL	(505)667-0819	(505)665-4747	mcinroy@lanl.gov
Meincke, Carol	SNL/NM	(505)844-0197	(505)844-0470	clmeinc@sandia.gov
Merker, Michael	Mound-DOE MEMP	(513)865-3644	(513)865-4763	Michael_Merker@em.doe.gov
Merry, Donna	Hanford - Waste Management, Site P2 Lead	(509)376-9773	(509)376-5560	donna_s_merry@rl.gov
Miller, David	SNL/NM	(505)284-2574	Not available	drmille@sandia.gov
Mizner, Jack	SNL/NM	(505)845-3576	(505)844-3747	jhmizner@sandia.gov
Molley, Kylene	SNL/NM, Site P2 Coordinator	(505)284-3982	(505)844-3747	kjmolle@sandia.gov
Morton, Mark	Hanford - BHI	(509)372-9618	(509)372-9447	mrmorton@BHI-ERC.com
Mose, Joe	LANL - DOE Field Office	(505)667-5808	(505)665-4504	jmose@doe.lanl.gov
Murnane, Chris	LANL - DOE	(505)665-8774	Not available	cmurnane@doe.lanl.gov
Murray, Shauna	Weldon Springs - M/K Ferguson	(314)441-8086	(314)447-0739	Not available
Nelson, T.B.	LANL	(505)667-8233	Not available	tnelson@lanl.gov
Newman, Mitch	Portsmouth	(740)879-2700	(740)897-2900	Not available
Nichols, David	Hanford, Waste Management Services	(509)376-4351	(509)373-0743	david_h_nichols@rl.gov
Nickels, Helen	SLAC	(650)926-3371		
Osborn, Scott	Fernald - Fluor Daniel	(513)648-5665	(513)648-5678	Scott_Osborn@Fernald.gov
Patterson-Smith, Tania	SRS - DOE SRS Operations Office	(803)725-8131	(803)725-7548	taniak.patterson-smith@srs.gov

Name	Location	Phone Number	Fax Number	E-mail Address
Pauling, Tom	Weldon Springs - DOE	(314)441-8086	(314)441-0739	Not available
Peek, Georgianne	SNL/NM	(505)844-9855	(505)844-7426	ghpeek@sandia.gov
Pendleberry, Laura	Pantex Plant	(806)477-3117		
Penny, Gail	BNL , Site P2 Coordinator	(516)344-3429	(516)344-3444	Gpenny@BNL.gov
Perkins, Dee	Portsmouth - DOE Site Office	(614)879-5524	(614)879-3572	Not available
Pflug, Dale	ANL, TechCon Program	(630)252-6682	(630)252-6614	pflugd@anl.gov
Pueyo, Maria	Princeton Plasma Physics Lab	(609)243-2213	(609)243-3366	mpueyo@pppl.gov
Rael, George	Albuquerque Operations Office, ER Director	(505)845-4887	Not available	gracl@doeal.gov
Rampe, John	Rocky Flats	Not available	Not available	john.rampe@rfets.gov
Raubfogel, Sally	SNL, Livermore, Site P2 Coordinator	(510)294-2341	(510)294-3418	sjraubf@sandia.gov
Redeker, Becky	Bonneville Power Administration - DOE	(503)230-6603	(503)230-3314	rlredeker@bpa.gov
Rhodes, Alisa	Fernald - Fluor Daniel, Recycle Coordinator	(513)648-4966	(513)648-5701	Alisa_Rhodes@Fernald.gov
Ritzcovan, Pete	EM-50, Technology Integration	(301)903-7919	(301)903-7457	Peter.Ritzcovan@em.doe.gov
Robinson, Gary	Hanford, Bechtel	(509)372-9221	(509)372-9447	gsrobinson@bhi-erc.com
Rondinella, Mary Ann	DOE Grand Junction Office	(970)248-6077	(970)248-6040	mrondinella@gjpomail.doegjpo.com
Roybal, Anthony	SNL/NM - ES&H Center	(505)284-2475	(505)284-2617	jaroyba@sandia.com
Schlosberg, Bill	Kansas City Plant - Allied Signal, P2 Lead	(816)997-3673	(816)997-7257	wschlosberg@kcp.com
Schmucker, Steve	Battelle - Columbus, Site P2 Coordinator	(614)424-3344	(614)424-7990	Schmucks@battelle.org
Sharma, Harish	Albuquerque Operations Office	(505)845-4275	(505)845-6286	hsharma@doeal.gov
Sheeley, Roy	Oak Ridge, Metals Recycle Program	(423)476-7742	(423)241-2533	s4y@ornl.gov
Sheneman, Robert	Princeton Plasma Physics Lab	(609)243-3392	(609)243-3366	rshenema@pppl.gov
Sieben, Ann	Rocky Flats - RMRS	(303)966-9886	(303)966-6406	Not available
Smith, Brian	LBNL	(510)486-6508	(510)486-4776	brian_smith@srs.gov
Starke, Tom	LANL , Site P2 Coordinator	(505)667-6639	(505)665-8118	tps@lanl.gov
Stone, Keith	SRS - BNFL, Site P2 Coordinator	(803)557-6317	(803)557-6306	keith.stone@srs.gov
Suderman, Bill	SNL/NM, metals and lead recycling	(505)844-4218	(505)844-3747	wjsuder@sandia.gov
Sweitzer, Mike	DOE AL Operations Office	(505)845-4347	(505)845-6286	msweitzer@doeal.gov
Tallent, Angela	East Tennessee Technology Park	(423)241-5074	(423)576-7668	AP6@arnl.gov
Tidwell, David	Paducah - DOE Field Office	(502)441-6807	(502)441-6801	Not available
Trychta, Keith	ANL-East, Site P2 Coordinator	(630)252-1476	(630)252-7190	ktrychta@anl.gov
Turner,Debbie	Golden - DOE Field Office	(303)275-4746	(303)275-4788	dturner@tcplink.nrel.gov
Veenis, Steve	LANL	(505)665-9735	Not available	veeniss@eshmail.lanl.gov
Venneman, John	Portsmouth, Site P2 Coordinator	(740)897-2700	(740)897-2331	v87@ornl.gov
Walters, Jim	Battelle - Columbus	(740)424-4746		
Walters, Pam	West Valley Nuclear Services Campany	(716)942-4813	(716)942-2110	waltersp@wv.doe.gov
Weinrach, Jeff	LANL - Benchmark Environmental	(505)262-2694	(505)262-2698	weinrach@becorp.com

Name	*Location*	*Phone Number*	*Fax Number*	*E-mail Address*
Willis, Frank	RMI Environmental Services	(404)993-1971	(404)993-1918	Frank_willis@rmies.com
Woodin, C.	WIPP			Woodin@wipp.carlsbad.nm.us
Worsham, Shelly	LBNL, Site P2 Coordinator	(510)486-4193	(510)486-4776	Not available
Yerace, Pete	Fernald - DOE Fernald Field Office	(513)648-3161	(513)648-3076	pete_yerace@fernald.gov
Yurako, Kathy	Oak Ridge - ORNL, Life Cycle Costing	(423)241-2290	(423)574-1778	yurakokl@ornl.gov
Zebrowski, Vince	Pantex Plant - DOE Field Office	(806)477-5969	(806)477-6927	Not available
Zeisloft, James	Hanford - DOE Richland Operations Office	(509)372-0188	(509)376-0306	james_h_jr_zeisloft@rl.gov
Zvonar, Cynthia	DOE Carlsbad Area Office	(505)234-7495	(505)234-7024	zvonarc@wipp.carlsbad.nm.us